Amendments to Claims:

This listing of claims will replace all prior revisions, and listings, of claims in the application:

Listing of Claims:

1. (Original) A method for controlling a physical variable at a frequency of interest (f_d) including the steps of:

a) sampling the physical variable at a sample frequency less than twice the frequency of interest (f_d);

b) calculating at least one control command based upon the sampling of the physical variable; and

c) generating a force for controlling the physical variable based upon the control command.

2. (Original) The method of Claim 1, further including the steps of:

bandpass filtering the physical variable prior to said step a).

3. (Original) The method of Claim 2 wherein said bandpass filter extracts a frequency range with a lower bound generally given by $(2n-1)*f_s/2$ and an upper bound generally given by $(2n+1)*f_s/2$, where n is an integer chosen so that the frequency of interest (f_d) is within the extracted frequency range.

4. (Currently Amended) The method of claim 1 wherein said physical variable includes information within a bandwidth including said frequency of interest and wherein said sampling ~~rate~~ frequency is at least twice the bandwidth of this information.

5. (Original) The method of claim 1 further including the step of generating the at least one control command at a rate less than twice the frequency of interest.

6. (Original) A method for computing control commands at a reduced rate in a noise or vibration control system including the steps of:

a) sensing a physical variable;

b) identifying harmonic components (a_k, b_k) of the physical variable at a frequency of interest (f_d);

c) down-sampling the harmonic components (a_k, b_k) to a lower update frequency (f_u);

d) performing control computations on the harmonic components(a_k, b_k) at the lower update frequency (f_u); and

e) generating control commands based upon the control computations.

7. (Original) The method of Claim 6 further including the step of:

f) generating harmonic components of the control commands in said step e).

8. (Original) The method of Claim 7, further including the step of:

g) generating a control output at a frequency higher than the lower update frequency.

9. (Original) The method of Claim 6 further comprising:

low-pass anti-aliasing filtering to prevent aliasing in sampling at a lower update frequency (f_u).

10. (Original) The method of Claim 6, further comprising:

obtaining estimates of the harmonic components by computing a fast-Fourier transform of the physical variable; and

extracting the result corresponding to the frequency of interest (f_d).

11. (Original) The method of Claim 6, wherein said physical variable comprises a plurality of physical variables, said method further including the steps of:

f) generating a sensed signal as a function of each of said plurality of physical variables; and

g) computing harmonic estimates z_k for each sensed signal y_k at each sample time t_k according to $z_k = z_{k-1} + \rho H(y_k - H^T z_{k-1})$, where:

$H = [\ 1\ \cos(f_d\, t_k)\ \sin(f_d\, t_k)\ \cos(f_x t_k)\ \sin(f_x t_k), \ldots]^T$ and where:

$f_d t_k$= desired frequency;

$f_x t_k$= frequency of unwanted information in y_k;

z_k = estimates of harmonic content of y_k at time k;

z_{k-1} = estimates of harmonic content at time k-1;

ρ= a variable gain that determines the corner frequency of the first order low-pass anti-aliasing filter;

y_k = sensed signal vector at time k;

$(\cdot)^T$= transpose of a vector or matrix.

12. (Original) The method of Claim 11, further comprising

utilizing every N^{th} harmonic estimator output z_{Nk} where N is the ratio of the sampling frequency and the update frequency (f_s/f_u).

13. (Original) The method of Claim 11, further comprising:

generating separate control commands for each of multiple tones;

adding control commands for each tone; and

outputting a sum of the control commands for each tone to one or more force generators.

14. (Original) A method for analyzing a physical variable having a first frequency of interest f_1 and a second frequency of interest f_2 including the steps of:

a) identifying first harmonic components a_{k1}, b_{k1} of the first frequency of interest f_1;

b) down-sampling the harmonic components a_{k1}, b_{k1} at an intermediate frequency f_{u1};

c) identifying second harmonic components a_{k2}, b_{k2} of a difference between the first frequency of interest f_1 and the second frequency of interest f_2;

d) downsampling the harmonic components a_{k2}, b_{k2}at an update frequency f_{u2}; and

e) analyzing information at the first frequency of interest f_1 and the second frequency of interest $f_2$based upon said harmonic components a_{k1}, b_{k1} and a_{k2}, b_{k2}.

15. (Original) The method of Claim 14 wherein the intermediate frequency f_{u1} is higher than the update frequency f_{u2}.

16. (Original) The method of Claim 14 further including the steps of:

f) generating control signals at the update frequency f_{u2} based upon said step e).

17. (Original) An apparatus for sensing physical variables at a reduced rate comprising:

a sensor adapted to sense physical variables and to generate a sensed signal as a function of the sensed physical variable; and

a control circuit adapted to establish a frequency of interest (f_d), and to establish a sample frequency (f_s),

wherein the control circuit filters the sensed signals to extract a frequency range with a lower bound given by $(2n-1)*f_s/2$ and an upper bound given by $(2n+1)*f_s/2$, where n is an integer chosen so that the frequency of interest (f_d) is within the extracted frequency range.

18. (Original) The apparatus of Claim 17, wherein the control circuit attenuates the filtered sensed signal at a frequency less than the frequency of interest (f_d) by high-pass anti-aliasing to produce a resultant signal.

19. (Original) The apparatus of Claim 17 wherein the control circuit aliases the filtered sensed signal to a lower frequency when there is no information present at the lower frequency in the sensed signal and the control circuit extracts desired information.